ASSESSMENT OF GROUNDWATER QUALITY IN THE SURROUNDING REGIONS OF SRIVILLIPUTTUR DUMPSITE

G. Hariesh
PG Scholar, Department of Civil Engineering
Pandian Saraswathi Yadav Engineering College, Sivagangai, Tamil Nadu

D. Thenmozhi
Assistant Professor Department of Civil Engineering
Pandian Saraswathi Yadav Engineering College, Sivagangai, Tamil Nadu

Abstract

Inadequate and improper management of municipal solid waste disposal site pose serious environmental threats to their surrounding and nearby resident due to groundwater contamination, pollution problems and health risks. The present investigation was carried out to assess the groundwater contamination due to dumping of waste at landfill in Srivilliputtur town. Srivilliputtur municipality includes 33 wards and population of more than 85000 people. Waste dumped in the dumpsite is24MT. They are doing open dumping in the dumpsite. These practice leads to the infiltration of leach ate to the groundwater. Water samples from wells were collected during febraury, 2020 and were analysed for the water quality parameters such as pH, electrical conductivity (EC), total dissolved solids(TDS), total solids(TS), dissolved oxygen(DO), BOD, COD, chloride, alkalinity, total suspended solids(TSS). The results shows that water samples of wells were contaminated. Therefore this landfill is threat for environment as well as for the local people and the local authority must pay their attention to prevent further contamination of the groundwater in this area.

Introduction

Water Treatment Using Coagulant

Although landfills have been identified as one of the major threats to groundwater resources, they are still the common method of waste utilization. A combination of physical, chemical, and microbial processes in the waste transfers pollutant from the waste material to the percolating water creating a strong polluted leach ate. A landfill leach ate contains s large number of compounds; some of which can be expected to be a threat to nature, especially to groundwater. Because of a substantial risk to local resource users and to the natural environment, the assessment of the groundwater quality near to landfills should be an essential element of each land fill management.

In Srivilliputtur, some 24metric ton of waste is generated per day, from which approximately 90% are deposited in landfills. In the year of 1984 to till, 33 wards of municipal solid waste were dumped in the dumpsite. Total area of Srivilliputtur land area is 6 square kms. Groundwater existing close to these landfills is subjected to an infiltration of very contaminated water from improperly sealed or not sealed dumping sites or from surface runoffs from landfill areas. A grave problem is damages to the geo membrane resulting in the penetration of runoff into the groundwater environment. The extend of the threat to groundwater can be different depending on the technical equipment of a landfill and the way it is operated. The scale of the impact depends on the kind of the ground environment as well as on the hydrological conditions around a given landfill. In the present

study, the impact of the Srivilliputtur landfill in Tamilnadu on the groundwater has been assessed. The quality of groundwater has been estimated using the experimental studies. The analysis of the samples

Scope

Assessment of ground water result in creating awareness regarding health hazards to the people in and around M.S.W dumpsite in Srivilliputtur. Groundwater is the major source for agriculture and domestic purposes. So the infiltration of leach ate will cause major health hazards. Diseases such as hepatitis and dysentery may be caused by contamination. Other long term effects such as certain types of cancer may also result from exposure to polluted water

Objectives

- To assess the quality of ground water in and around Municipal solid waste dump yard at Srivilliputtur.
- To analyses of different physicochemical parameters are the prime factors to determine the quality of water.
- To assess the suitability of groundwater for domestic purposes suggest that groundwater in the district is of acceptable quality.
- To help the reader better understanding the geochemistry of groundwater in three different canal catchment areas of northwest Rajasthan. It was found that geology itself is the main cause of deteriorated groundwater quality in this area. High levels of TDS and F^- are major water quality issues in drinking purpose, and community-based quality control equipments should be installed to avoid human health issues. Wise use of nitrogen fertilizers will reduce the risk of nitrate enrichment in groundwater. Mixing of canal water with groundwater could be the safe alternative in both drinking and irrigation. Selection of salt-tolerance species and frequent irrigation might reduce the risk of agricultural damage in the study area.

Material Collection

Identification of Collection wells

Identify the collection wells which are nearer to the Dumpsite. In my study area there are three wells which are very nearer to the Dumpsite. These wells are also located in three different directions of the Dumpsite. So easily identify the flow of groundwater and infiltration of leach ate in which direction.

Collection of Samples

In each well, collected five litres of water sample in plastic cane. Then stored it in ambient temperature freezer. Because the reaction of micro organism will change the properties of groundwater. To resist the groundwater reaction it should be stored in that freezer. Water samples were procured from twelve hand-dug wells, whose depths varied from 4 to 12 m, located in the

vicinities of municipal solid-waste dumpsites open - air defecation sites, twice a month for period of three months in the dry season and another period of three months in the wet season. Water quality parameters analyzed in accordance to standard methods of [9] were pH, temperature, conductivity, total solids (TS), total suspended solids (TSS), total dissolved solids (TDS), turbidity, nitrate (NO3 -), sulphate (SO4 2-), phosphate (PO4 3-), copper (Cu), lead (Pb), cadmium (Cd), dissolved oxygen (DO), chemical oxygen demand (COD), biochemical oxygen demand (BOD), fecal coliform (FC) and total coliform (TC) counts.

Assessment of Ground water parameters

As from the literature study, they were decided to assess some parameters. They are pH, TDS, TSS, TS, BOD, COD, Alkalinity, Chloride, EC, DO. These are the parameters which are commonly assessed in every groundwater sample.

A pH value is a number from 1 to 14, with 7 as the middle (neutral) point. Values below 7 indicate acidity which increases as the number decreases, 1 being the most acidic.

TDS Total dissolved solids (**TDS**) is a measure of the dissolved combined content of all inorganic and organic substances present in a liquid in molecular, ionized or micro-granular (colloidal sol) suspension form.

DO Dissolved Oxygen is the amount of gaseous oxygen (O2) dissolved in the water. Oxygen enters the water by direct absorption from the atmosphere, by rapid movement, or as a waste product of plant photosynthesis. Water temperature and the volume of moving water can affect dissolved oxygen levels.

EC Conductivity is a measure of water'**s** capability to pass electrical flow. This ability is directly related to the concentration of ions in the water Compounds that dissolve into ions are also known as electrolytes. The more ions that are present, the higher the conductivity of water.

A TS Total solid is a measure of the suspended and dissolved solids in water. Suspended **s**olids are those that can be retained on a water filter and are capable.

TSS Total Suspended Solids (TSS) are solids in water that can be trapped by a filter. TSS can include a wide variety of material, such as silt, decaying plant and animal matter, industrial wastes, and sewage. High concentrations of suspended solids can cause many problems for stream health and aquatic life.

COD Chemical oxygen demand (**COD**) is a measure of the capacity of water to consume oxygen during the decomposition of organic matter and the oxidation of inorganic chemicals such as Ammonia and nitrite.

BOD Biochemical Oxygen Demand (**BOD**, also called Biological Oxygen Demand) is the amount of dissolved oxygen needed (i.e. demanded) by aerobic biological organisms to break down organic material present in a given water sample at certain temperature over a specific time period.

Alkalinity Alkalinity is a measure of the **water's** ability to neutralize acidity. An alkalinity test measures the level of bicarbonates, carbonates, and hydroxides in water and test results are generally

expressed as "ppm of calcium carbonate ($CaCO_3$)". The desirable range f or irrigation water is 0 to 100 ppm calcium carbonate.

Chloride Chloride and water quality. Chlorides are salts resulting from the combination of the gas chlorine with a metal. Some common chlorides include sodium chloride (**NaCl**) and magnesium chloride ($MgCl_2$).

Result and Discussions

Characterization of Groundwater

The list of examined parameters is provided in table. The variations of analyzed parameters are provided in the form of graphical representations.

Table 1: List of examined parameters

PARAMETERS	SAMPLE-1	SAMPLE-2	SAMPLE-3
pH	**6.75**	**6.71**	**6.82**
DO	**3.6 mg/l**	**5.6 mg/l**	**6.1 mg/l**
TDS	**2691 mg/l**	**2462 mg/l**	**1704 mg/l**
EC	**4485 µs/cm**	**4103.3 µs/cm**	**2840 µs/cm**
COD	**124 mg/l**	**64 mg/l**	**NIL**
TSS	**60 mg/l**	**70 mg/l**	**360 mg/l**
Alkalinity	**4.2 mg/l**	**2.4 mg/l**	**3.2 mg/l**
TS	**2751 mg/l**	**2522 mg/l**	**2064 mg/l**
BOD	**24 mg/l**	**56 mg/l**	**NIL**
Chloride	**173.95 mg/l**	**161.02 mg/l**	**89.50 mg/l**

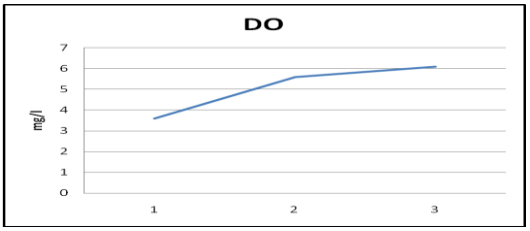

Figure 1 DO Value

The DO of the groundwater samples are ranging from 3.6 to 6.1mg/l. **Fig.1** represents the variation of DO values. The minimum level of DO in water 4 mg/l.

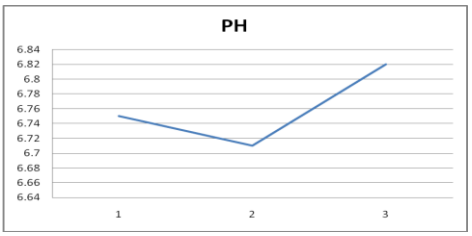

Figure 2 pH Value

The pH of all the groundwater samples was about soft acid and neutral; the range being from 6.75 to 6.82. **Fig.2** represents the variation of pH values. It indicates that the decomposition process in landfill is stabilized and at the methanogenesis stage.

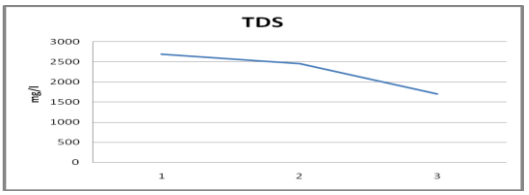

Figure 3 TDS Value

The TDS of the groundwater samples are ranging from 1704 to 2691 mg/l. **Fig.3** represents the variation of TDS value. The permissible limit of TDS in water 2100 mg/l.

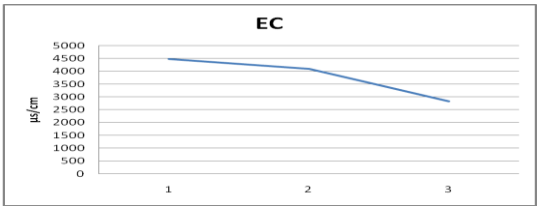

Figure 4 EC Value

The electrical conductivity of the groundwater samples are ranging from 2840 to 4485 µs/cm. **Fig.4** represents the variation of EC values. It indicates the conductivity of water.

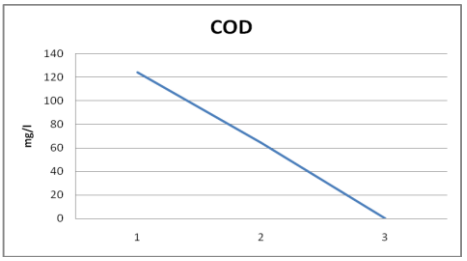

Figure 5 COD Value

The COD of the groundwater sample 1 is 124mg/l and sample 2 is 64mg/l but sample 3 contains no COD. **Fig.5** represents the variation of COD values.

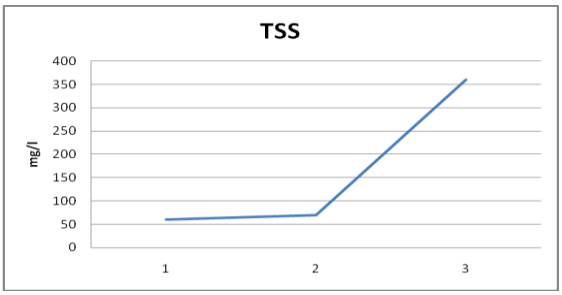

Figure 6 TSS Value

Total suspended solids of the groundwater samples ranging from 60mg/l to 360mg/l. Fig. 6 represents the variation of TSS values

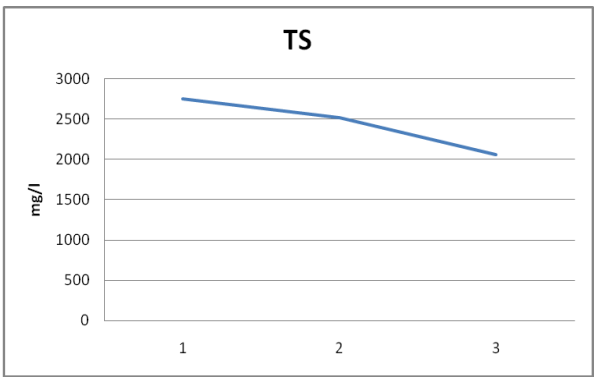

Figure 7 TS Value

Total solids of the groundwater samples ranging from 2064 to 2751mg/l. Fig7 represents the variation of TS values

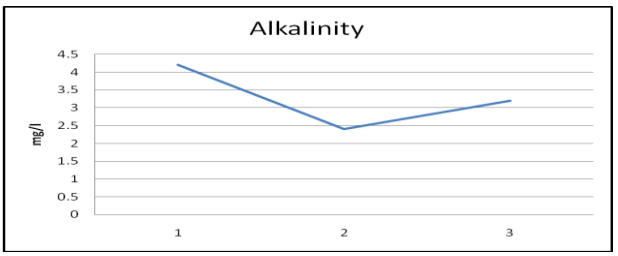

Figure 8 Alkalinity Value

Alkalinity of the groundwater samples are ranging from 2.4 to 4.2mg/l. **Fig.8** represents the variation of alkalinity value. The permissible limit of alkalinity in groundwater is 20-200mg/l.

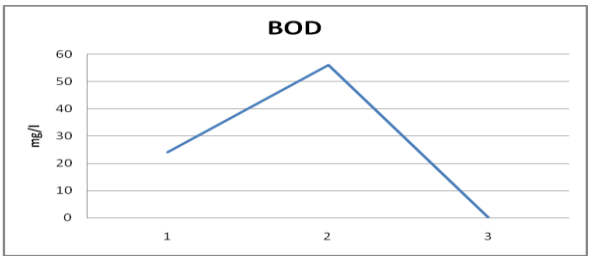

Figure 9 BOD Value

The BOD of the groundwater sample 1 is 24mg/l and sample 2 is 56mg/l but sample 3 contains no BOD. **Fig.9** represents the variation of BOD values. The permissible limit of BOD is less than 30mg/l.

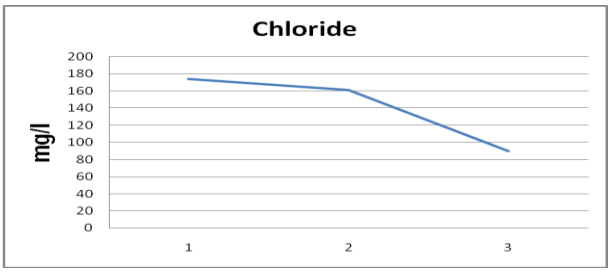

Figure 10 Chloride value

Chloride content of the groundwater samples are ranging from 89.50 to 173.95mg/l. **Fig.10** represents the variation of chloride values. The permissible limit of chloride content in groundwater is 250mg/l.

Conclusion

Results obtained in this study reveal that the quality of the groundwater near the municipal dumpsite has been strongly impacted. The TDS, TS, BOD and COD concentration in the groundwater from the dumpsite were higher than the permissible limit. The concentration of TDS is ranging from 1704 to 2691mg/l. The concentration of TS is ranging from2064 to 2751mg/l. The concentration of BOD is ranging from 24 to 56 mg/l.

The concentration of COD is ranging from 64 to 124 mg/l. The remaining parameters are within the permissible limits. For the comparison purpose and identify the flow of leach ate in the underground. Another sample was collected from a controlled well which is located 400m from the west side of the dumpsite. In this sample all the parameters are within the permissible limit and it doesn't create any impacts. Here concluded that the flow of groundwater from west to east direction and also the flow of contamination is also towards the east direction of dump site.

References

1. Abdukrafiu O. Majolagbe, Adebola A. Adeyi, 2016 pollution vulnerability and health risk assessment of groundwater around an engineering landfill in lagos, Nigeria.
2. R.M. Kurakalva, K.K. Aradhi, K.Y. Mallela, 2015 Assessment of Groundwater Quality in and around the Jawaharnagar Municipal solid waste Dumping site at the Greater Hyderabad.
3. Central Pollution Control Board, 2015 Consolidated Annual review report prepared in the compliance to the provision 8(2) of the MSW rules (2000), India: Ministry of environment and forest, New Delhi.
4. Izabela A. Talalaj, 2014 Assessment of groundwater quality near the landfill site using the modified water qualityindex.
5. Bing Zhang, Xianfang song, Yinghua Zhang, 2012 Hydrochemical characteristics and water quality assessment of surface water agroundwater in songnen plain, Northeastchina.
6. Tamer M. Alslaibi, Yunes K. Mogheir,2011 Assessment of Groundwater quality due to municipal solid waste Landfills Leachate.
7. Singh, K. U., Kumar, M., Chauhan, R., Jha, & Subramanian, v.,2008 Assessment of the impact of Landfill groundwater quality: a case study of the pirana site in westernIndia
8. DC. Babiker, I. S., Mohamed, A. A., Mohamed, T. H., 2007. Assessing groundwater quality using GIS. Water Resour Manage
9. W. Bruce, Mark, F., Becker, Larry, M., Pope, Jason, J. Gurdak, 2003. Ground-Water Quality beneath Irrigated Agriculture in the Central High Plains
10. Magesh N. S., Krishnakumar S., Chandrasekar N., and Soundranayagam J. P. (2013): Groundwater quality assessment using WQI and GIS techniques, Dindigul district, Tamil Nadu, India.
11. Arab J Geosci. Piper, A.M., 1944. A graphical procedure in the chemical interpretation of groundwater analysis. Trans. Amer. Geophy.